October 26, 2006

Beth Schreier
Natural Resources Conservation Service
451 West Street
Amherst, MA 01002

Dear Ms. Schreier:

This document transmits the U.S. Fish and Wildlife Service=s (Service) biological opinion regarding the effects of the proposed federally-funded river restoration of the Mill River at Brook Hollow Road in Hatfield, Massachusetts on the federally-listed endangered dwarf wedgemussel (*Alasmidonta heterodon*). Our biological opinion is prepared in accordance with Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

Our biological opinion is based on information provided in your August 24, 2006 letter requesting initiation of formal consultation, and enclosed design plans. It is also based on telephone conversations, electronic communications and meetings with your agency, the U.S. Army Corps of Engineers (ACOE) New England District staff, Massachusetts Natural Heritage and Endangered Species Program (MANHP), Massachusetts Department of Environmental Protection (MADEP), and Town of Hatfield staff. A complete administrative record of this consultation is on file at this office.

I. CONSULTATION HISTORY

The consultation history regarding this project is provided in Appendix 1.

II. BIOLOGICAL OPINION

Description of Proposed Actions

The focus of the proposed action, removal of culverts on the Mill River at Brook Hollow Road in Hatfield, Massachusetts, is to enhance fish passage and freshwater mussel habitat. The project will require the removal of two recently installed metal culverts and connected concrete bedding, removal of a temporary cofferdam made of jersey barriers and polyethylene material, and excavation of fill material deposited around the cofferdam.

The recently-installed culverts were part of an original fish passage enhancement project that proposed to remove a collapsed four-foot-diameter culvert and fill at the Brook Hollow Road crossing of the Mill River. The original culvert was to be replaced by three twelve-foot-diameter culverts embedded in flow-through material. In addition to providing enhanced fish passage, the original project proposed to restore the Brook Hollow Road crossing, a short access route to agricultural fields lying south and east of the Mill River. The fields are also accessed via a longer route traversing a number of town roads.

The original river restoration project was partially completed in early October 2005. Two of the three culverts had been embedded in the river when high water events prevented placement of the third culvert on October 7. Continued high water levels precluded completion of the project. During site visits conducted by the MANHP, MADEP, the USDA, the ACOE and this office, it was determined that the original project was not in compliance with ACOE permit requirements and the original project was reassessed. Based on discussions between the Town of Hatfield and state and federal agencies, it was determined that the culverts should be removed and the river restored to its natural condition.

The following are project-specific restoration activities in order of anticipated implementation. Contractor specifications for these activities provided in the initiation package were previously reviewed and commented on by state agencies, this office and the ACOE to reduce and avoid adverse effects to dwarf wedgemussels and other natural resources.

- Install erosion and sediment control measures, including a turbidity curtain.
- Relocate dwarf wedgemussels and state-listed freshwater mussels found during a survey of an area extending 50 meters upriver and 100 meters downriver of the project.
- Move state-listed wood turtles (*Clemmys insculpta*) found in the project area during a survey conducted immediately prior to initiation of restoration activities.
- Re-shape the left bank of the stream and channel to provide for unrestricted stream flow, if deemed necessary.
- Remove existing concrete barriers.[1]
- Install cofferdam.
- Re-establish existing sediment basin.
- Remove existing culverts, concrete bedding and gravel. The work does not need to occur in the dry, but cannot be performed in flowing water.
- Dewater work area prior to removing cofferdam and turbidity curtain.
- Remove cofferdam and turbidity curtain.
- Install water bar on town road on the north side of the river.
- Shape bank on north side of the river.
- Seed all disturbed areas and mulch.

[1] During periods of extreme low flow, concrete barriers may be removed prior to the other activities if the barriers are located out of the water. Change in the proposed implementation schedule is per agreement reached by cooperating agencies on September 28, 2006 (Susi von Oettingen, 2006 memorandum).

An individual dwarf wedgemussel was discovered, marked and relocated on September 20, 2005 during a survey of the original culvert replacement project area for state-listed freshwater mussels. The survey area encompassed the immediate project area, 50 meters upriver and 100 meters downriver. The discovery occurred two days prior to the initiation of construction activities associated with the original culvert replacement project. On October 4, 2005, the marked dwarf wedgemussel was found in the translocation site during a follow-up survey.

A number of conservation measures have been incorporated into the project proposal in order to minimize adverse effects to dwarf wedgemussels. These measures are summarized below:

1) Sediment and erosion control
   a. Instream work will not begin until erosion and sediment control measures are in place.
   b. Temporary pervious barriers of hay or straw will be staked to the ground or a sediment filter fabric fence will be installed to check erosion and/or sedimentation around the staging area and at each end of Brook Hollow Road.
   c. Work will be conducted in the dry to the maximum extent possible. A cofferdam made of concrete barriers and plastic liners will surround the culverts prior to their removal and direct sediment to an existing sediment basin on the north side of the river.
   d. A turbidity curtain will be installed downstream of the project limit to contain sediments during removal of the cofferdam.
   e. Permanent vegetative cover will be established once the project is completed.

2) Dwarf wedgemussel conservation measures
   a. All dwarf wedgemussels within the project impact area will be collected, marked and relocated within three weeks of the initiation of construction activity.
   b. Relocation and construction activities will not occur during high flows.
   c. If necessary, steps to minimize disturbance to relocated dwarf wedgemussels will be implemented, including:
      1) mussels will be maintained at a constant temperature that is the same as the ambient temperature of the relocation site;
      2) atmospheric exposure of mussels will be limited to 40 minutes or less.

Background Information

The dwarf wedgemussel is the only North American freshwater mussel that has two lateral teeth on its right valve and only one lateral tooth on its left valve. The outer shell is often dark with a greenish cast, though it may be faintly rayed in younger, lighter animals. The anterior end is rounded, while the posterior end is lengthened and angular, giving this mussel its characteristic "wedge-shape". The dwarf wedgemussel rarely exceeds 1.5 inches in length (U.S. Fish and Wildlife Service 1993).

The dwarf wedgemussel is found solely in Atlantic Coast drainage streams and rivers of various sizes and moderate current. It has been found in a variety of substrates including firm sand, clay banks, muddy sand, and mixed sand, gravel and cobble. In the southern portion of its range, it is often found buried under logs or root mats in shallow water (U.S. Fish and Wildlife Service 1993). In the northern portion of its range, the dwarf wedgemussel has been found in firm substrates of mixed sand, gravel, cobble, or embedded in clay banks in water depths of a few inches to greater than 20 feet (Fichtel and Smith 1995; Gabriel 1995; Gabriel 1996; Nedeau 2002).

The reproductive cycle of freshwater mussels appears to be similar for nearly all species. During the spawning period, sperm is discharged by males into the water column, and taken in by females during siphoning. Eggs are fertilized in the gills, which serve as marsupia for larval development to mature glochidia. Upon release into the water column, mature glochidia attach to the buccal cavities, gills and fins of species-specific host fish to encyst and eventually drop off onto the substrate as juvenile mussels. Host fish for this species include the tessellated darter (*Etheostoma olmstedi*), Johnny darter (*E. nigrum*), mottled sculpin (*Cottus bairdi*) (Michaelson and Neves 1995), slimy sculpin (*C. congatus*) and juvenile Atlantic salmon (*Salmo salar*) (B. Wicklow, St. Anselm College, Goffstown, NH, pers. comm. 1996).

The dwarf wedgemussel is considered to be a long-term brooder. In Virginia, this species spawns in late summer, and becomes gravid in September with glochidia maturing in November (Michaelson 1993). Dwarf wedgemussel glochidia are generally released between March and June with peak release times varying from south to north. Michaelson (1993) estimated that dwarf wedgemussels release glochidia in North Carolina in April. Wicklow (unpublished 2000) observed glochidia release beginning in March and continuing through June in the Ashuelot River in New Hampshire. In a study of dwarf wedgemussel reproduction in the Mill River, Massachusetts, McLain and Ross (2005) observed that most glochidia were released in April and May. Reproductive output appears to be correlated with local population abundance. McLain and Ross (2005) documented that sites with the highest abundance of adult mussels also demonstrated the highest proportion of gravid females, glochidial density, host infection and density of juvenile mussels.

The dwarf wedgemussel was federally-listed as endangered on March 14, 1990. At one time, this species was recorded from 70 localities in 15 major drainages ranging from North Carolina to New Brunswick, Canada. Based on preliminary information,[2] the dwarf wedgemussel is found in 15 major watersheds (Table 1) comprising approximately 70 “sites” (one site may have multiple occurrences). At least 45 of these sites are based on less than five individuals or solely on spent shells. The only known occurrence in New Brunswick, Canada (Petticodiac River) appears to be historic; no live mussels or spent shells were found during a 1997 survey (Hanson 1998).

[2] Virginia site information is not current.

Table 1. Dwarf wedgemussel major watersheds.[3]

State	Major Drainage	County
NH	Upper Connecticut River	Coos, Grafton, Sullivan, Cheshire
VT	Upper Connecticut River	Essex, Orange, Windsor, Windham
MA	Middle Connecticut River	Hampshire, Hampden
CT	Lower Connecticut River	Hartford
NY	Middle Delaware	Orange, Sullivan, Delaware
PA	Upper Delaware River	Wayne
NJ	Middle Delaware	Warren, Sussex
MD	Choptank River	Queen Anne's, Caroline
MD	Lower Potomac River	St. Mary's, Charles
MD	Upper Chesapeake Bay	Queen Anne's
VA	Middle Potomac River	Stafford
VA	York River	Louisa, Spotsylvania
VA	Chowan River	Sussex, Nottoway, Lunenburg
NC	Upper Tar River	Granville, Vance, Franklin, Nash
NC	Fishing River	Warren, Franklin
NC	Contentnea	Wilson, Nash
NC	Upper Neuse	Johnson, Wake, Orange

The main stem of the Connecticut River in New Hampshire and Vermont is considered to have the largest remaining dwarf wedgemussel population within its range, consisting of three distinct stretches of sporadically occupied habitat segmented by hydroelectric dams. The northernmost Connecticut River population, from Northumberland to Dalton, New Hampshire, is scattered throughout an approximately 18-mile stretch of river (Gabriel and Fichtel 1995; Nedeau 2006). The only site that has been repeatedly surveyed and monitored is located in Lunenburg, Vermont. Surveying at this location was initiated as a result of a bank stabilization and mussel translocation project. In 1997, 536 dwarf wedgemussels were moved upriver of the bank stabilization project. In 2000, more than 5,000 dwarf wedgemussels were found in the relocation site, the stabilization site, and an area immediately downstream of the bank stabilization project (Gloria and Wicklow 2001). Within a 30m x 10m plot in the translocation area, 985 dwarf wedgemussels were located. The numbers observed in the Lunenburg area indicate a population that may be in the tens of thousands.

A second, 14-mile stretch of the Connecticut River between Haverhill, New Hampshire (Newbury, Vermont) and Piermont, New Hampshire (Bradford, Vermont) was discovered in 2005 and intensively surveyed in 2006 (Nedeau 2006). Twelve occurrences within this stretch and the relative ease in locating live dwarf wedgemussels at these sites indicate a large population, possibly numbering in the 100,000's. The southern population found in the 18-mile stretch of river between Plainfield and Charlestown, New Hampshire has been surveyed and intermittently monitored from 1988 through 2001. Strayer (1994) considered this population to

[3] Watersheds based on USGS and EPA Cataloguing Units, see http://water.usgs.gov/GIS/huc_name.html and http://cfpub.epa.gov/surf/locate/index.cfm.

have one of the highest densities and the largest distribution of any of the dwarf wedgemussel populations (this was prior to the discovery of the upriver populations). Past monitoring efforts of the lower Connecticut River population were based on catch-per-unit although this method is not considered to be statistically valid. Nonetheless, five lower Connecticut River sites were monitored between 1991 and 1995, three on an annual basis. Results ranged from zero dwarf wedgemussels/hour to 24.3 dwarf wedgemussels/hour. However, the catch rate exceeded 10 dwarf wedgemussels/hour for only two of 22 monitoring efforts (Gabriel 1996).

Dwarf wedgemussels are presumed extirpated from historic locations in the main stem of the Connecticut River in Massachusetts and Connecticut. However, several tributaries have extant populations, including the Mill and Fort Rivers in Massachusetts and the Farmington River in Connecticut, the largest tributary to support dwarf wedgemussels. The Farmington River has 14 known sites scattered throughout an 8-mile stretch of river (Nedeau 2005; Nedeau 2006).

Human activity has significantly degraded dwarf wedgemussel habitat, causing a general decline in populations and a reduction in distribution of the species (U.S. Fish and Wildlife Service 1993; Michaelson 1993). Primary factors responsible for the decline of the dwarf wedgemussel include: 1) impoundment of river systems, 2) pollution, 3) alteration of riverbanks, and 4) siltation (U.S. Fish and Wildlife Service 1993).

Damming and channelization of rivers throughout the dwarf wedgemussel's range have resulted in the elimination of much of its formerly-occupied habitat. In general, dams and river channelization activities result in the loss or alteration of mussel habitat (Watters 2001). Immediately upstream of a dam, conditions such as heavy silt deposition, low current and low oxygen levels are not conducive to the maintenance of dwarf wedgemussel populations. Immediately downstream of these dams, remaining habitat is subject to daily water level and temperature fluctuations and scour, conditions stressful or intolerable to sensitive dwarf wedgemussels. The main stem Connecticut River populations are separated by a series of dams and miles of habitat that are no longer suitable for dwarf wedgemussels. There are at least five dams remaining on the Ashuelot River, with only one population of dwarf wedgemussels occurring between the Swanzey Dam and the Surry Mountain Flood Control Dam. Construction of water supply reservoirs in the Neuse River watershed in North Carolina separated one contiguous population and may result in the extirpation of a second population (U.S. Fish and Wildlife Service 2006 *in litt.*).

Domestic and industrial pollution was the primary cause for mussel extirpation at many historic sites. Mussels are known to be sensitive to a wide variety of heavy metals and pesticides, and to excessive nutrients and chlorine (Havlik and Marking 1987; Valenti *et al.* 2006). Juvenile mussels may be especially sensitive to pollutants since they have less energy reserves than adult mussels and are thinner shelled, possibly absorbing more toxicants (Valenti *et al*. 2006). Mussel die-offs have been attributed to chemical spills, agricultural waste run-off, and low DO levels. In one instance in August of 2001, more than 25 dwarf wedgemussels and hundreds of other mussel species (including state-listed species) were killed in the Connecticut River watershed by waste run-off from a small farm (S. Jackson, University of Massachusetts, Amherst, MA, pers. comm. 2001). Some pollutants indirectly impact the mussels; for example, nitrogen and phosphorus cause organic enrichment, and in extreme cases, oxygen depletion.

Riverbank alteration includes bank erosion control measures, such as riprap, and removal of vegetation, particularly shade trees and bushes. Placement of unwashed riprap along the bank will result in increased sedimentation in the water column, while placement of stones in the river will bury mussel beds and habitat. Removal of shade trees and bushes in small stream systems may lead to significant daily water temperature fluctuations and alter light levels, potentially affecting both the mussels and host fish species. These detrimental activities have been observed on numerous occasions within the Connecticut River watershed and include riparian vegetation removal along a golf course on the Ashuelot River, riverbank stabilization on the main stem of the Connecticut River (permitted and illegal), and removal of riparian vegetation, streambank stabilization, and construction of a weir on the Mill River in Massachusetts.

Siltation, generated by road construction, agriculture, forestry activities, and removal of streambank vegetation, is considered to be an important factor in the decline of many freshwater mussel species, including the dwarf wedgemussel. Sediment loads in rivers and streams during periods of high discharge may be abrasive to mollusk shells. Erosion of the outer shell allows acids to reach and corrode underlying shell layers (Harman 1974). Irritation and clogging of gills and other feeding structures in mussels occur when suspended sediments are siphoned from the water column (Loar *et al.* 1980), severely affecting the mussel's normal activity or even causing death.

Freshwater mussels are relatively sedentary and cannot move quickly or for long distances, therefore, they cannot easily escape when silt is deposited over their habitat. Ellis (1936) found that mussels could not survive in substrate on which silt accumulated to depths over 0.6 - 2.5cm. He observed dying mussels with large quantities of silt in their gills and mantle cavities and attributed their deaths to interference with feeding and to suffocation. In addition, Mr. Ellis determined that siltation from soil erosion reduced light penetration, altered heat exchange in the water, and allowed organic and toxic substances to be carried to the bottom where they were retained for long periods of time. This resulted in further oxygen depletion and possible absorption of these toxicants by mussels (Harman 1974).

Recently, severe flooding in the Neversink River in New York resulted in the destruction of occupied habitat and loss of dwarf wedgemussels. Surveys conducted at two sites below a dam in Cuddleback, New York resulted in abundance estimates ranging from 60 to 500 dwarf wedgemussels per site (Cole *et al.* 2004). In 2005, severe flooding scoured the river channel and deposited cobble in at least one of the sites previously surveyed. Resurveys of the two sites conducted after the flood event detected one fresh dead dwarf wedgemussel and no live mussels (J. Cole, Appalachian Laboratory, Frostberg, MD, pers. comm. 2006).

A further probable adverse effect on many mussel species is the impact of sedimentation, pollution or habitat fragmentation on host fish species. Some fish species are vulnerable to changes in light, turbidity, flow and pollutants. Water quality degradation that affects host fish species or barriers that prevent fish movement within the stream or river corridor may adversely affect mussels by reducing their ability to successfully infest host fish with glochidia.

Most of the dwarf wedgemussel populations are small and geographically isolated from each other (U.S. Fish and Wildlife Service 1993). This isolation restricts exchange of genetic material among populations, and reduces genetic variability within populations (U.S. Fish and Wildlife Service 1993). Strayer (1994) conducted a rangewide assessment of the dwarf wedgemussel (the assessment did not include the populations in the middle upper reaches of the Connecticut River in New Hampshire), examining thirteen rivers and streams from New Hampshire to North Carolina. Mr. Strayer concluded that all 13 populations of the dwarf wedgemussel, including the population in the lower Connecticut River, are vulnerable to loss because of their small range, low population densities, linear ranges, or some combination of the three factors. However, for all but one of the populations studied, densities determined by Mr. Strayer were large enough so that he did not expect them to be affected by problems such as inbreeding or demographic stochasticity. Nevertheless, Mr. Strayer felt that these populations demonstrated lower fertilization rates than other freshwater mussel species, even though there was evidence of reproduction at most sites.

Effects of the Federal Action on the Dwarf Wedgemussel and its Habitat

Environmental Baseline

The environmental baseline is a summary of the status and health of the species and/or its habitat in the area affected by the proposed action. As defined in 50 CFR 402.02, "action" means all activities or programs of any kind that are authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas. The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The direct and indirect effects of the actions and activities resulting from the federal action must be considered in conjunction with the effects of other past and present federal, state or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area.

Description of the Action Area

The determination of the action area is based on the consideration of all direct and indirect effects of the proposed action. The project action area encompasses the Mill River 50 meters upriver and 100 meters downriver of the proposed work area lying within the existing cofferdam. Within the action area, construction activities include the 1) removal of concrete jersey barriers; 2) removal of plastic sheeting; 3) removal of two 12'x 8' x ~30' culverts and associated concrete fill; 4) excavation of sediments, and riverbank restoration and revegetation.

Status of the Species in the Action Area

The Mill River is a tributary of the Connecticut River flowing south through the Towns of Whately and Hatfield, Massachusetts. Dwarf wedgemussels were first discovered in the river in 1995 (McLain 1995 *in litt.*). McLain intensively surveyed the watershed for dwarf wedgemussels over a period of three years and estimated a population of over 1,000 individuals scattered sporadically throughout an 8.4-mile (13.5 km) stretch of river between Whately and Hatfield (McLain 1998). Dwarf wedgemussels had not been documented below the dam in Hatfield during previous surveys, although four other species, including two state-listed species, had been documented at and below Brook Hollow Road (McLain 1998).

Only one individual dwarf wedgemussel was found during a pre-construction survey in 2005. The mussel was marked, moved upriver of the project impact area, and relocated two weeks later during a survey of the translocation area. No other surveys for dwarf wedgemussels were conducted subsequent to the initial survey. It is probable that a very small population of dwarf wedgemussels exists within the project action area based on the discovery of the single dwarf wedgemussel. Currently, the habitat adjacent to the culverts has been degraded by the placement of jersey barriers, torn plastic sheeting, illegal fill (for an ATV trail) and erosion. It is unlikely that dwarf wedgemussels are adjacent to the culverts proposed for removal, however, suitable habitat exists immediately up- and downriver of the culverts.

The Mill River is considered to have the largest population of dwarf wedgemussels in Massachusetts and has been the focus of local, regional and state conservation efforts. Critical wetlands associated with the river are protected near the upper reaches of the River. The Mill River Watershed Assessment Project, a multi-disciplinary research effort, has investigated the river's water chemistry, conducted bioassessment studies, a fish survey, and a stream buffer survey.

Factors Affecting the Species Within the Action Area

Agriculture and development dominate the landscape throughout much of the Mill River watershed. The Mill River is adversely impacted by agricultural practices including a lack of vegetated buffers between commercial crops and the river, direct access to livestock, run-off from fields and livestock, and sedimentation. In 2001, run-off from a drainage ditch filled with silage and dredge spoils entered the Mill River during low flows, resulting in a fish and mussel die-off. Over 25 dead dwarf wedgemussels were collected during the die-off at a location previously not known to support this species (Huckery 2001 *in litt*.).

Roaring Brook, a primary tributary to the Mill River, supplies water to the City of Northampton, Massachusetts from a reservoir near its headwaters. During periods of significant water withdrawals, flow from Roaring Brook to the Mill River is negligible, ultimately affecting water levels in the Mill River. Currently, there is no regulatory avenue for either the MANHP or the Service to negotiate improved flows from Roaring Brook.

Direct and Indirect Effects

Section 7 of the ESA and implementing regulations require the Service to evaluate the direct and indirect effects of an action on the listed species or designated critical. Additionally, the Service must also consider the effects of other activities that are interrelated or interdependent with that action.[4] Direct impacts to the dwarf wedgemussel will occur from: 1) short-term degradation of mussel habitat as a result of sediment released during construction activities, and 2) marking and moving mussels. Some of the direct impacts may occur as suffocation and feeding inhibition caused by increased sediment deposition downriver of the project area, and stress from the handling, marking and moving of mussels that may result in short-term reduced productivity or death of adults and/or juveniles.

[4] An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

Impacts of this project may be avoided or minimized by limiting the time of year and the flows in which instream construction occurs, employing necessary measures to limit siltation in the waters of the Mill River, and translocating individuals to a suitable, safer location. These minimization measures have been incorporated into the project proposal (see page 3 of this opinion). The majority of the dwarf wedgemussel population and the habitat outside of the action area is not expected to be affected, either directly or indirectly, as a result of the proposed action.

Indirect effects are defined as those that are caused by the proposed action and are later in time, but still reasonably certain to occur (50 CFR 402.02). Indirect effects to adult and larval mussels may result from rain events both during and after construction (before vegetation has been established on disturbed ground), and during and after the removal of the sediment curtain. Even though sediment control measures will be in place, some erosion is expected to occur, thereby temporarily increasing turbidity in the Mill River in the action area.

Beneficial effects

The ultimate objective of the proposed project is to improve fish passage for anadromous and resident fish species in the Mill River. The tessellated darter, host fish for the dwarf wedgemussel, was observed in the project area during the original project's pre-construction surveys and will benefit from improved fish passage. The project will also 1) improve flows in a previously constricted portion of the river, 2) enhance freshwater mussel habitat through the reduction in the accumulation of fine silt, and 3) revegetate Brook Hollow Road and both river banks, thereby reducing erosion.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Dwarf wedgemussels and the water quality of the Mill River may be adversely affected by pollution such as nitrogen, phosphates, nutrients and agricultural pesticides from adjacent agricultural lands. Brook Hollow Road is a non-maintained town road that accesses agricultural fields south of the river. Removal of the culverts and excavation of the fill should preclude passage by vehicles. However, it has been observed that all-terrain vehicles (ATVs) use Brook Hollow Road and cross the Mill River during low flows. Illegal fill allowing ATVs to cross the river was documented in September 2006. Although the project proposes to place jersey barriers across both sides of Brook Hollow Road, it is anticipated that ATVs will continue to cross the river at low flows, causing sedimentation, erosion of the river bank, and possibly crushing mussels that may recolonize habitat created by the river restoration activities.

Conclusion

In conclusion, the removal of two culverts and jersey barriers, the excavation of sediment and the containment of sediment within dwarf wedgemussel habitat may result in the 1) direct mortality of individuals not found and translocated, 2) injury and loss of individuals resulting from mussel translocation, and 3) potential interruption of feeding due to a temporary increase of sediments in the water column. However, after reviewing the current status of the dwarf wedgemussel, the

environmental baseline for the action area, the effects of the river restoration project and the cumulative effects, it is the Service's biological opinion that the Brook Hollow Road restoration project is not likely to jeopardize the continued existence of the dwarf wedgemussel. No critical habitat has been designated for this species; therefore, none will be affected.

The non-jeopardy determination is based on the short duration of adverse effects to the habitat, and the very small and localized population of dwarf wedgemussels that may be harmed or killed. The subpopulation of dwarf wedgemussels at the project area is a fraction of the overall population of dwarf wedgemussels in the Mill River. The possible loss of a few individuals is not expected to significantly affect genetic diversity or long-term productivity of the overall Mill River population. Mussel relocation and construction activities may occur during the breeding season. However, the project is not anticipated to occur during peak glochidia release; therefore, impacts to productivity should be limited to loss of juveniles not found during pre-construction surveys. Conservation measures included in the project proposal should also insure that the species will not be jeopardized. Ultimately, the project will result in benefits to the population by improving degraded habitat and providing enhanced fish passage.

III. INCIDENTAL TAKE

Section 9 of the ESA and federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is defined by the Service as an act that actually kills or injures wildlife, and is further defined as significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The USDA has a continuing duty to regulate the activity that is covered by this incidental take statement. The measures described below are non-discretionary, and must be implemented by the USDA in order for the exemption in Section 7(o)(2) to apply. If the USDA fails to adhere to the terms and conditions of the incidental take statement, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USDA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(I)(3)].

Amount or Extent of Incidental Take Anticipated

The Service anticipates that incidental take of dwarf wedgemussels throughout the action area will be difficult to detect. Current monitoring methodology generally does not give precise

population counts, and detecting a significant change in the population may take years or decades. A significant percentage of the dwarf wedgemussel population within the project area may occur below the surface of the substrate at any given time, precluding exact mussel counts. Although spent shells may be collected, attributing the cause of mortality may be difficult. Juvenile mussels are extremely difficult to detect, therefore it is impossible to document take of this life stage.

The Service anticipates that incidental take of the dwarf wedgemussel is likely to occur during construction in the form of direct killing of an unknown but extremely small number of individuals (those that are not moved out of the action area), temporary loss of occupied, suitable habitat, and harm to an unknown number of individuals due to physical disturbance, siltation, and other water quality degradation.

Relocation of dwarf wedgemussels is expected to avoid direct mortality of some mussels from the construction and fill activities. However, incidental take in the form of some level of mortality is expected. Cope and Waller (1995) conducted a literature review of mussel relocations and evaluated the relative success of this technique as a conservation and management strategy. They determined a mean mortality of 49% of relocated mussels, based on an average recovery rate of 43%. However, most of the relocation experiments involved marking mussels and moving them to a more distant location, thus requiring the containment of mussels for a period of time outside of the river, and translocation of mussels between sites in coolers. Dunn *et al.* (2000) reviewed a number of relocation studies, and conducted studies to determine factors important to successful mussel relocation efforts. They determined that the success in relocating freshwater mussels was dependent on a number of factors, including the time of year, stress to mussels from handling and transport, and the substrate into which the mussels were moved; and observed mortality ranging from 0 to 11.8%.

H. E. Kitchel (1995) attempted to assess the effectiveness of mussel relocation by marking and moving mussels to an adjacent area, and compared survival rates to mussels marked but not moved (as a control to isolate the effect of marking alone). An average of approximately 7% of the total percent of individuals recovered was from marked spent shells, suggesting high survival. In addition, it was determined that moving mussels did not significantly appear to reduce or arrest growth.

In 1997, 536 dwarf wedgemussels (87 marked) were relocated out of a bank stabilization impact area to a refuge 500m upriver of the project area. The relocation site was monitored for three consecutive years with little mortality documented. Gloria and Wicklow (2001) documented 11 live marked mussels in 1998 (13%), 17 live marked mussels in 1999 (20%), and 27 live marked mussels in 2000 (31%). Only one marked dead mussel was found in 2000 (3% mortality). A number of marked animals were found more than one time. The number of unmarked mussels in the relocation site remained relatively consistent, indicating that mortality resulting from the relocation was insignificant.

Dwarf wedgemussels found within the project area will be marked and immediately placed upriver of the action area; mussels will not spend an extended period of time out of the water. Based on the literature, the 1997 relocation of dwarf wedgemussels in the upper Connecticut

River, and efforts to minimize stress to the relocated dwarf wedgemussels, the Service anticipates a mortality rate for relocated mussels in the project area to range from 3% observed by Gloria and Wicklow (2001) to 7% rate reported by Kitchel (1995).

Based on the September 20, 2005 survey, we anticipate that less than five dwarf wedgemussels can be expected to be translocated to another site with expected mortality of, or harm to, more than one moved mussel due to stress or injury from the translocation process. An unknown quantity of dwarf wedgemussels, most likely greater than the number of relocated mussels, will be lost due to crushing during the placement of the cofferdam and the excavation of material deposited around the original project structures (two culverts and original cofferdam).

Effect of the Take

The Service has determined that the level of anticipated take is not likely to result in jeopardy to the dwarf wedgemussel.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to further minimize impacts of incidental take of dwarf wedgemussels:

- Siltation of the water column of the Mill River must be minimized to the maximum extent feasible to avoid stress or death of dwarf wedgemussels.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the USDA (and the applicant) must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary. The terms and conditions associated with the reasonable and prudent measures articulated in this biological opinion will minimize the level of incidental take identified for the dwarf wedgemussel.

Construction Activities

- Ensure that all conservation measures described in the project proposal summarized on page 3 of this biological opinion are implemented.
- Construction vehicles will not be stored, serviced, washed or flushed in a location where leaks, spills, waste materials or cleaners will be introduced into wetlands or watercourses.
- Maintenance or refueling of equipment and vehicles will occur at least 150 feet from wetlands or watercourses at a location where drainage is directed away from the river.
- On-site refueling and maintenance locations will be approved prior to construction by the engineer or a member of the Hatfield Conservation Commission.
- Absorbent material will be placed on the ground prior to refueling to catch spills that may occur, and will be removed after construction is completed.

All necessary permits for collecting dwarf wedgemussel shells and conducting mussel monitoring must be obtained.

If freshly-killed dwarf wedgemussels are found in the project area, care must be taken in their handling to preserve biological material in the best possible condition. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if incidental take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead, injured, or sick specimen of an endangered or threatened species, prompt notification must be made to the Supervisor, New England Field Office, 70 Commercial St., Suite 300, Concord, NH 03301, telephone 603-223-2541.

The USDA or the town must contact the Service four weeks before initiation of construction to ensure proper coordination on this project and implementation of the terms and conditions of the incidental take statement.

Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. The Service may provide, in conjunction with the biological opinion, a statement containing discretionary conservation recommendations. Conservation recommendations are advisory, and are not intended to carry any binding legal force. These recommendations are discretionary agency activities taken to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendation.

No additional conservation measures have been identified for this project.

IV. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the USDA's August 24, 2006 initiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law), and if 1) the amount or extent of incidental take is exceeded; 2) new information reveals consequences of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates the opportunity to work with the U.S. Department of Agriculture in fulfilling our mutual responsibilities under the ESA. Please contact Susi von Oettingen of this office at (603) 223-2541 if you have any questions or require additional information.

Sincerely yours,

Michael J. Bartlett
Supervisor
New England Field Office

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APPENDIX 1

Consultation History
Mill River Restoration at Brook Hollow Road, Hatfield, Massachusetts

September 20, 2005 – The Service notified that a single dwarf wedgemussel was found in the vicinity of a culvert removal project. No ACOE permit was obtained for the project.

December 15 through December 22, 2005 – Electronic communications between MANHP, the Service's New England Field Office (NEFO), and the ACOE, describing original project, possible water quality violations, and arranging site visit.

December 22, 2005 – Site visit with representatives from the ACOE, MANHP, MADEP, the USDA, and the Town of Hatfield.

December 28, 2005 – Letter from MANHP to NEFO, providing background information on original project.

January 03, 2006 to February 14, 2006 – Electronic communications between the ACOE, NEFO, MANHP, and Tighe and Bond (Consultants for the Town of Hatfield) in preparation for meeting to discuss alternatives to original project.

February 15, 2006 – Meeting between state and federal agencies, the Town of Hatfield and consultants to review original plan and its implementation, possible ACOE permit inconsistencies, and to discuss ESA Section 7 consultation requirements.

February 16 through March 31, 2006 - Electronic communications between MANHP, the USDA, the ACOE, the Town of Hatfield, Tighe and Bond, and the Service, discussing options to completing original project and additional meetings.

June 21, 2006 – Site visit to discuss draft plans to remove existing culverts and repair bank erosion.

June 23 through July 17, 2006 - Electronic communications between MANHP, the ACOE, MADEP, the USDA, NEFO, and the Town of Hatfield to draft river restoration plans and develop survey and monitoring protocol for freshwater mussels.

July 27, 2006 – Teleconference between the USDA, the Town of Hatfield, and NEFO.

July 27, 2006 – Memorandum from the USDA to NEFO, summarizing teleconference.

August 01 to August 22, 2006 - Electronic communications between the USDA, MANHP, NEFO and the ACOE, finalizing plans for the Brook Hollow Restoration.

August 24, 2006 – The USDA requests initiation of formal Section 7 consultation for the Brook Hollow Project.

September 5, 2006 – NEFO responds to the USDA initiation request.

September 8 through September 29, 2006 – Electronic communications between the USDA, the ACOE, MANHP, Town of Hatfield, and NEFO, developing plans, conservation measures and survey protocol to remove jersey barriers and sediment and fill deposited between old cofferdam prior to October 31.

September 25, 2006 – MANHP provides written requirements for which removal of jersey barriers and excavation of sediment and illegal fill could proceed.

September 29, 2006 – Site visit to review MANHP recommendations in order to proceed with the excavation of sediment and removal of plastic sheeting, hay bales and jersey barriers.